P: ISSN NO.: 2394-0344 RNI No.UPBIL/2016/67980 VOL-3* ISSUE-7* October- 2018
E: ISSN NO.: 2455-0817 *Remarking An Analisation*

Tools & Research Methodology for Geographical Studies (With Special Reference to Urban Sprawl)

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Abstract

The goal of the research process is to produce new knowledge. Research is often conducted using the hourglass model Structure of Research. The hourglass model starts with a broad spectrum for research, focusing in on the required information through the methodology of the project), then expands the research in the form of discussion and results. There are several important aspects to research methodology. Steps of the scientific method are shaped like an hourglass - starting from general questions, narrowing down to focus on one specific aspect, and designing research where we can observe and analyze this aspect. At last, we conclude and generalize to the real world.

In a legitimate scientific study of any problem in social sciences, all the steps of scientific method are strictly observed. The chief concern of the researcher is to find out the causes and results of the problem and then to analyse the cause and effect relationship of the problem in a way that he can arrive at some generalization.

The paper which is designed with a purpose of making an overview of social science research, aims at exploring the tools and methods which are generally used in social science research, and at pointing out ones that are helpful to the geographers associated with the study of urban sprawl around the world. For the purpose, the secondary data available in the various sources, and particularly on the various internet sites have been used

Keywords: Dimensions, Research Methodology, Qualitative Research, Quantitative Research, Primary Data, Secondary Data, Survey, Observation, Tools & Techniques

Introduction

Research can be defined as the search for knowledge, or as any systematic investigation, with an open mind, to establish facts, usually using a scientific method. The primary purpose for applied research (as opposed to basic research) is discovering, interpreting, and the development of methods and systems for the advancement of human knowledge on a wide variety of scientific matters of our world and the universe. To be familiar with the unknown and to explore the unexplored has ever been the passion of man. Research aims at exploring the unknown, systematically studying the social phenomena and interpreting the cause and effect relationship of the problem. Scientific research relies on the application of the scientific method, a harnessing of curiosity. This type of research provides scientific information and theories for the explanation of the nature and the properties of the world around us. It makes practical applications possible. Scientific research can be subdivided into different classifications according to their academic and application disciplines.

Geographical studies based on survey and fieldwork fall in the empirical and experimental research for which the use of both the primary and the secondary data is essential. Primary data is the data explored and collected for the first time by the researcher. It is all original, authentic and unpublished. The primary data is the soul of a research. It has a pivot role to play in research, as it is only through the primary data that the researcher explores something new about the problem to be studied. Secondary data is the data taken by the researcher from secondary

sources, internal or external. The researcher must thoroughly search secondary data sources before commissioning any efforts for collecting primary data. There are many advantages in searching for and analyzing data before attempting the collection of primary data. In some cases, the secondary data itself may be sufficient to solve the problem.

The geographers use both the types of data for their studies. The secondary data collected through the traditional sources, though a micro content analysis provide a feedback about the problem to be studied, while the primary data collected for the first time through the application of certain tools and techniques provide new information required for the study. Hence, for the geographical studies the following both the types of research are helpful-

1. Primary research (collection of data that does not yet exist)
2. Secondary research (summary, collation and/or synthesis of existing research)

The research in social sciences generally falls into the category of both the qualitative and the quantitative research, as through them the researcher tries his best to understand the behaviour of the selected units of information that vary in accordance with the nature of the research, and also tries to explore and study those reasons that govern such behaviour of the units.In social sciences, the following two research methods are applied, depending on the properties of the subject matter and on the objective of the research:

1. Qualitative research (understanding of human behavior and the reasons that govern such behavior)
2. Quantitative research (systematic empirical investigation of quantitative properties and phenomena and their relationships)

For the sake of maintaining the scientific spirit in his work, the geographers generally rely more in the quantitative than in the qualitative research. Generally, research is understood to follow a certain structural process. Though step order may vary depending on the subject matter and researcher, the following steps are usually part of most formal research, both basic and applied:

1. Observations and Formation of the topic
2. Study of the related literature and concentration on some of the relevant studies on the selected theme
3. Content analysis
4. Hypothesis formulation
5. Conceptual definitions
6. Operational definition
7. Collection of data
8. Analysis of data
9. Test, revising of hypothesis
10. Generalization.

Right from the first step, that is, observation and formation of the topic, to the last one, that is, generalization, all the steps of scientific method are observed by the geographers, and thus geographical studies are made.

Approved Tools & Techniques For Research

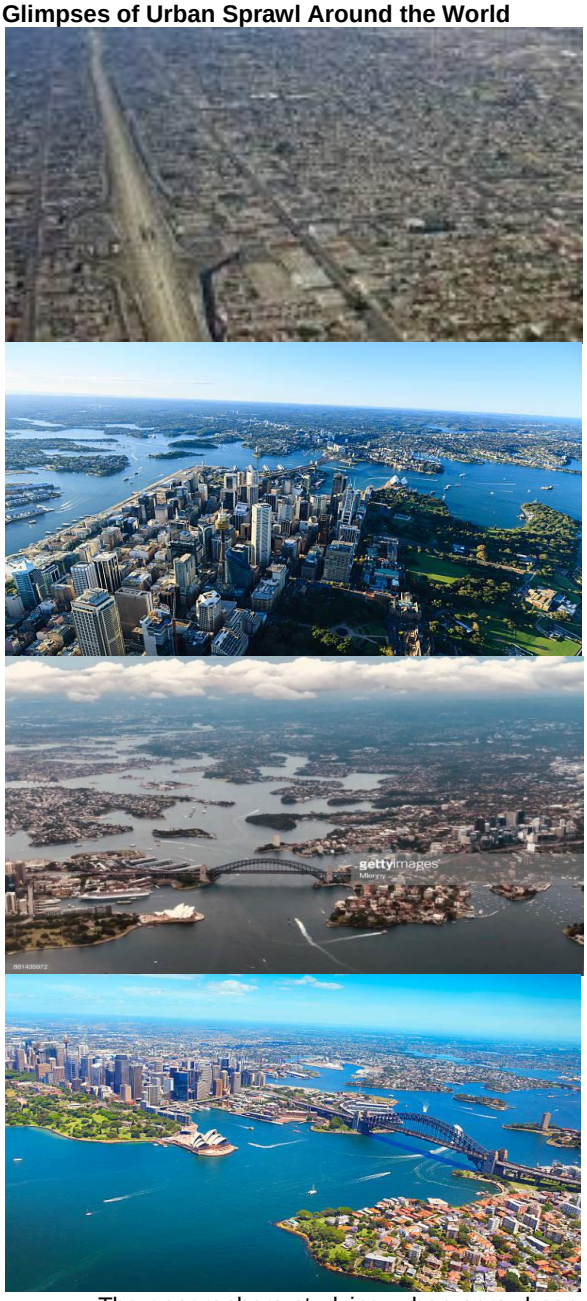
There are several research techniques which are adopted by the researcher in accordance with his requirement and the nature of the research problem. Some of the popular research techniques adopted by the social scientists for the purpose of research, and which help the researchers collect the primary and the secondary data include schedule, questionnaire, interview, case study etc. Each of the above research techniques has its own significance in research. As far as the geograhical studies are concerned, they being survey-and field work and experimental and empirical in nature, require the physical presence of the geographers during the course of the study, the schedule technique is more reliable than the other quoted techniques of research. Here it should be borne in mind that simply the schedule technique cannot provide all the information to the geographers, and so they should add certain tests and experiments to the use of the schedule technique. The techniques that geographers use in their work are not developed in a vacuum. They are developed to address specific problems and, thus, reflect the focus of the discipline at particular times. These techniques reflect the conscious decisions of geographers about the kinds of information that are important to collect; the spatial scales at which information should be collected, compiled, analyzed, and displayed; data sampling strategies and experimental designs; data representation; and methods for data analysis. As theoretical paradigms change, so do the techniques for empirical research. Thus, advancement of the discipline goes hand in hand with the development of new and improved techniques for collecting, analyzing, and interpreting information.

Urban Sprawl & Its Relationship With Geographical Research

The spread of a city into the area surrounding it, often without planning is called urban sprawl. Since it relates to the spread of the cities into the surrounding geographical areas, it is closely related to the geographical studies, and requires a serious concern of the geographers to study it and to interpret its causes and effects in various contexts.

The causes of urban growth are quite similar with those of sprawl. In most of the instances they can not be discriminated since urban growth and sprawl are highly interlinked. However, it is important to realise that urban growth may be observed without the occurrence of sprawl, but sprawl must induce growth in urban area. Some of the causes, for example population growth, may result in coordinated compact growth or uncoordinated sprawled growth. Whether the growth is good or baddepends on its pattern, process, and consequences. There are also some of the causes that are especially responsible for sprawl; they can not result in a compact neighbourhood. For example, country-living desire—some people prefer to live in the rural countryside; this tendency always results in sprawl.

Glimpses of Urban Sprawl Around the World



The geographers studying urban sprawl can rely on the following methods and tools of study for the sake of spatial data collection and utilization-

Geographic Information

Geographic information is the collection of information about places and events that occur on the Earth's surface. GIScience research includes topics that relate to cartography, remote sensing, photogrammetry, web mapping and spatial data organization. Digital data management of spatial information is also associated with GIScience.

Geographic Information Systems (GIS)

Geographic information systems (GIS) are systems for input, storage, manipulation, summarizing, editing, querying and visualizing geographic information.

Surveying

Surveying is the science of accurate measurement of natural and humanmade features on the Earth. Data collected by surveyors are then used to create highly precise maps. Surveyors calculate the precise position of points, distances and angles through geometry.

Remote Sensing

Remote sensing is the use of satellites orbiting the Earth to capture information of the surface and atmosphere. Satellites vary in spatial and spectral resolution. These signals are then transmitted to receiving stations on Earth where they can be transformed and distributed as digital images to be analyzed. Through the use of remote sensing, applying specific calculations to images can help spatial information analyst identify and classify features on a landscape such as changes in snowmelt and identifying the location of seasponges without physically setting foot in that region.

Maps

Maps are mathematical representations of Earth and the Earth's surface. They can be used for geospatial data storage, spatial exploratory functions and as an analytical tool.

Cartography

Cartography is the design, construction and evaluation of maps. When designed well, maps can be powerful communication tools. The practice of cartography may require the knowledge of graphic design, computer science, mathematics, statistics, psychology and, most certainly, geography.

Geovisualization

Geovisualization is the display of geospatial information to be explored interactively in an effort to facilitate the process of hypothesis formation and knowledge construction.

Digital Globes

Digital globes are three-dimensional representations of the Earth in high-resolution format. Digital globes provide many advantages. The user is able to scale up or down with ease since they are highly interactive. Digital globes are easy to transport since they are accessible on mobile and desktop computers, files can be shared easily and each user can choose a topic of interest to overlay on the globe.

Volunteered Geographic Information (VGI)

Volunteered geographic information (VGI) is information collected by users roving the surface of the Earth. VGI is the contribution of content regarding local activities in various geographic locations around the world that may traditionally go unnoticed by the rest of the world's media.

Location-Based Services (LBS)

Location-based services (LBS) are services that offer information about where a location-aware device user is situated

Global Positioning System (GPS)

A **g**lobal positioning system (GPS) is a satellite network that communicates with GPS receivers accessed by mobile users.

Objectives of the Study

1. To be familiar with the meaning of research and to learn about various types of research

2. To study the research process and the various steps that are undertaken by the researchers
3. To distinguish between the natural and social science research, and to concentrate on the research methods meant for the geographical studies
4. To explore the various methods and tools useful for the geographical studies
5. To concentrate on the concept of urban sprawl and its practical implications
6. To discuss the various causes and effects of the urban sprawl
7. To find the tools and techniques that can be helpful to the geographicars dedicated to the study of the urban sprawl
8. To interpret and analyze the issue in detail

Review of Literature

Singh, Yadvinder and Rajinder kaur (2008) deals with the urban ecosystem of Jalander city. Infrastructure with industrial and population growth. They studied development and expansion of the city. They assess industrialization and its interface with urban develpoemrnt concerning environmental degradation. Living condition of urban upper class people is good and lower class people in slum are miserable. Environmental degradation took place due to pollution, due to intense density of automobile and industrial noise and disposal of wastes and sewage water.

Saini, Vipin (2008) has studied the urban sprawl of Bikaner city. The objective is to identify the patterns of urban expansion and to analyze the causal factors of the urban expansion in Bikaner city. The analyzed topographical sheets, dynamic phenomenon of urban sprawl and land use change. He finds out that area of the city has increased faster than population. The city has expanded from walled city along major roads and railway tracts.

T. Cheng (2012) in Methods and tools for geographical mapping and analysis in primary health care observes that mapping and spatial analysis of indicators of locality health profiles and healthcare needs assessment are well-established facets of health services research and development. Geographical perspectives are now playing a significant role in PHC delivery, and for those engaged in informatics and/or managing population-level care, understanding key geographic information systems methods and terminologies are important as is gaining greater familiarity with institutional aspects of implementation.

S. N. Mohapatra, Padmini Pani and Monika Sharma (2014) in Rapid Urban Expansion and Its Implications on Geomorphology: A Remote Sensing and GIS Based Study observe that topography, vegetation, climate, water table, and even the anthropogenic activities all are affected by urban growth through diverse mechanisms. The study attempts to explore the implications of urban expansion on the geomorphological features of Gwalior city. Rapid urbanisation has led to significant changes and destruction of important geomorphological features of Gwalior city, which has been captured in the study through Remote Sensing and GIS techniques. The results show that the geomorphic features which are likely to be affected in future are the residual hills and the denudational hills apart from the plain areas due to the urban expansion. The natural drainage network of the city also gets affected by the urban expansion and the drainage is likely to be modified in future. The waste water disposal system will affect the water quality in the city unless proper precautionary measures are taken. A first hand database created for this study can provide critical inputs in understanding the urban dynamics of the city. Urban planners and authorities in the future may take into account the environmental problems that may arise by unscientifically demolishing the natural topographic features and landforms for the expansion of built-up land. Hence, taking into account the microgeomorphological features of the city and its surrounding areas, proper measures should be implemented for the improvement of future scenario.

Walid Oueslati, Seraphim Alvanides and Guy Garrod (2015) in Determinants of urban sprawl in European cities observe that the fundamental conclusions of the standard monocentric model are valid in the European context for both indices. Although the variables generated by the monocentric model explain a large part of the variation of artificial area, their explanatory power for modelling the fragmentation index is relatively low.

Linda McCarthy (Dec 19, 2016) in Urban Geography holds that in 2007, the world reached an urban milestone when the percentage of people living in cities exceeded 50 percent for the first time in history. By 2010, the world's urban population approached nearly 3.5 billion, and it is projected to rise to nearly 6.3 billion by 2050. To put these figures into historical perspective, in 1950 less than 30 percent of the world's population was urbanized. Urban geography can help us understand urbanization trends and their expression in urban spatial structure and to relate these to our own lives and concerns. The study of urban geography can help us have a better appreciation of the economics of what goes on within cities and recognize the interdependencies involved in local, national, and international economic development in an increasingly globalized world. It can provide us with a framework for conceptualizing urbanism in conjunction with an appreciation of history and the relationships among art, culture, and society. It can illuminate the interplay of science and technology with social and economic change; reveal important dimensions related to race, gender, and sexuality; identify important issues concerning social inequality, urban segregation, and gentrification; raise concerns about urban environmental quality; and point to important lessons for urban governance and policy. Most of all, of course, the study of urban geography can help us understand, analyze, and interpret the landscapes and communities of cities and metropolitan areas around the world. In fact, urban geography is arguably one of the most important subdisciplines within geography, and especially within human geography.

Hypothesis

1. Moving from the unknown to the known is the natural instinct of man
2. Research satisfies the man's natural instinct to learn about the unknown things
3. Research aims at interpreting the cause and effect relations of the problems
4. For the sake of research, some specific methodology is adopted
5. Tools and techniques help the researcher to collect the data required for the study
6. Geographical researches and studies require specific methodology, tools and techniques
7. Geographical approaches are different from the approaches with which the studies in other social sciences are conducted
8. Urban sprawl is a global issue
9. Urban sprawl is the feature of the countries with a high density of population
10. Urban sprawl is a geographical and geological concern
11. Urban sprawl requires specific studies

Methodology

The study is a focussed on the research methodology pertaining to geographical studies. For the purpose of understanding the research methodology, research design and tools and techniques of collecting data, the researcher simultaneously had his bent of mind on the various research methods prevailing in the geographical studies and on the issue of urban sprawl that needs to be studied specifically using the various latest tools and techniques. The steps undertaken by him include- selection of the title, going through the relevant related literature, selection of some of the studies found suitable for the purpose, content analysis, hypothesis formulation under alternative and null hypothesis in order to find a right direction for the work to be done, application of the analyzed contents in the context of urban sprawl, and finally arriving at findings and conclusion.

Findings

1. It is man's natural instinct to explore the unexplored and to know the unknown. He does not feel satisfied until he finds a satisfactory answer to his querries
2. Research is a panacea to all the natural and social problems as it helps in the understanding the causes and effects of the problem, and thus, in the control of the problem
3. Observation is the sole basis of research as it helps the researcher see the causes and effects of the problem with his own eyes
4. For geographical researches there are specific tools and techniques and a specific methodology which includes observation, surveying, remote sensing, cartography and mapping, display of geospatial information, digital globes, volunteered geographical information etc.
5. The approach of the geograher is more practical and practical than theoretical. His approach is different from the approaches of study adopted and applied by the researchers belonging to other fields
6. At present urban sprawl is a serious concern for the geographers and requires them to study it for the sake of deciding urban policies balancing the ecological, geological, demographic and urban features
7. The urban sprawl in India has created a new challenge for the town planners, builders, environmentalists and goverments
8. The study of urban sprawl needs to be made from different angles through a specific methodolgy considering all the aspects of urban sprawl

Conclusion

Research is a panacea to every challenge and problem whatever it is, and it can help one solve any problem through constant exploration. The steps in geographic inquiry are embodied in the "scientific method". The scientific method consists of systematic observation, formulation, testing and revision of hypotheses. If a hypothesis withstands the scrutiny of repeated experimentation and review it may be elevated to a theory. Theories may undergo revision as new data and research methods are improved. The scientific method includes: Observation, Hypothesis Formulation, Choose methods of analysis, Data collection, Analysis: Hypothesis testing, Hypothesis acceptance or rejection and Report results. Geographical studies require specific methods, tools and techniques. The problem of urban sprawl can be understood and governed only through its multi-aspect studies made by environmentalists, geographers, sociologists.

The geographical and geological studies and researches on urban sprawl in India can help the town planners and builders as well as the governments reshape and restructure the materialistic face of the Indian society as per the contemporary demands. It is only through the research that the town planners can plan the towns properly enough to accommodate the fast increasing population maintaining a balance between the population and ecology and environment in a way that with the changed circumstances, the people can be able to survive in cities and enjoy the city culture fascinated by which they resolve to settle down in cities for the sake of a better life than in villages.

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